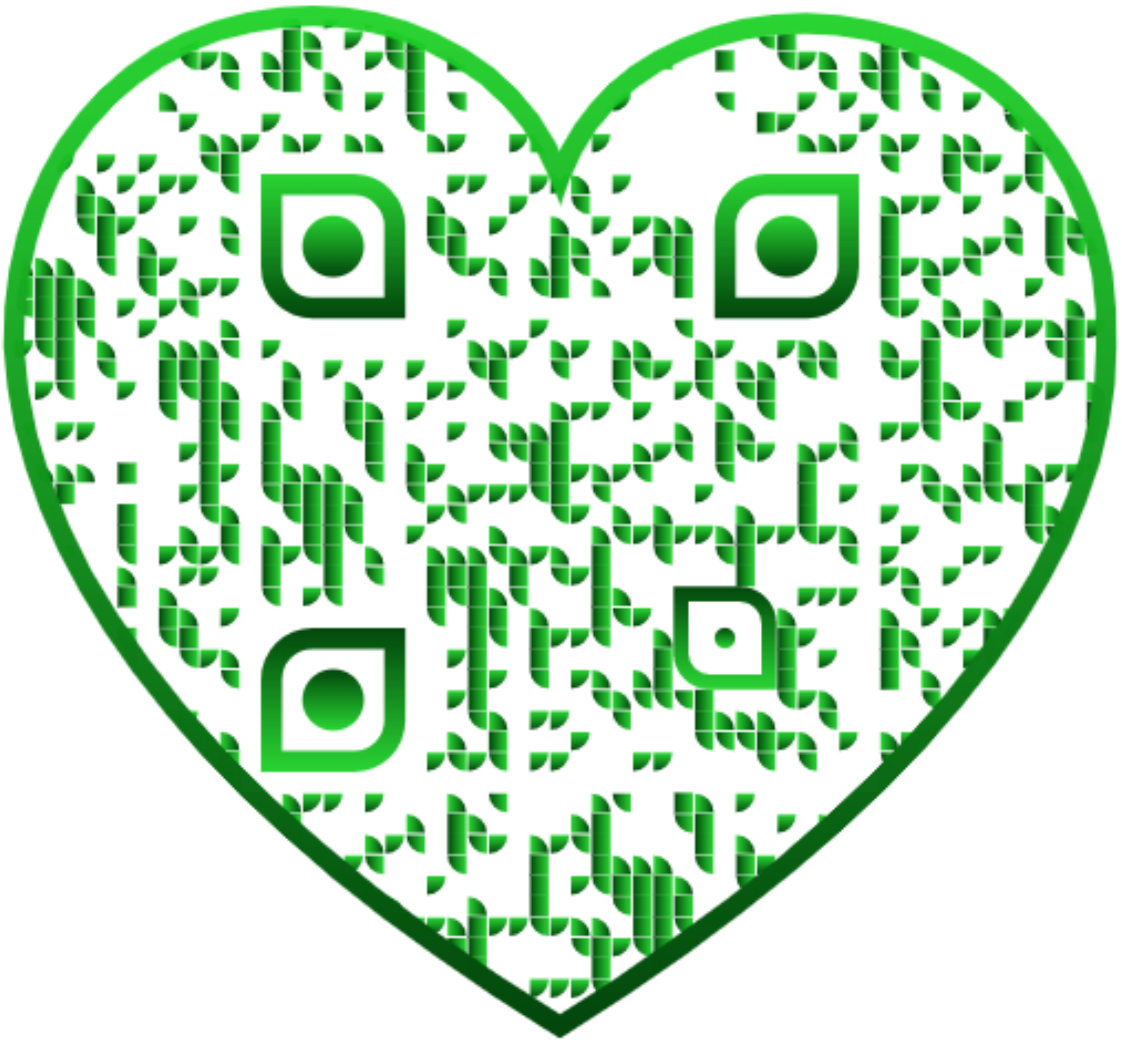
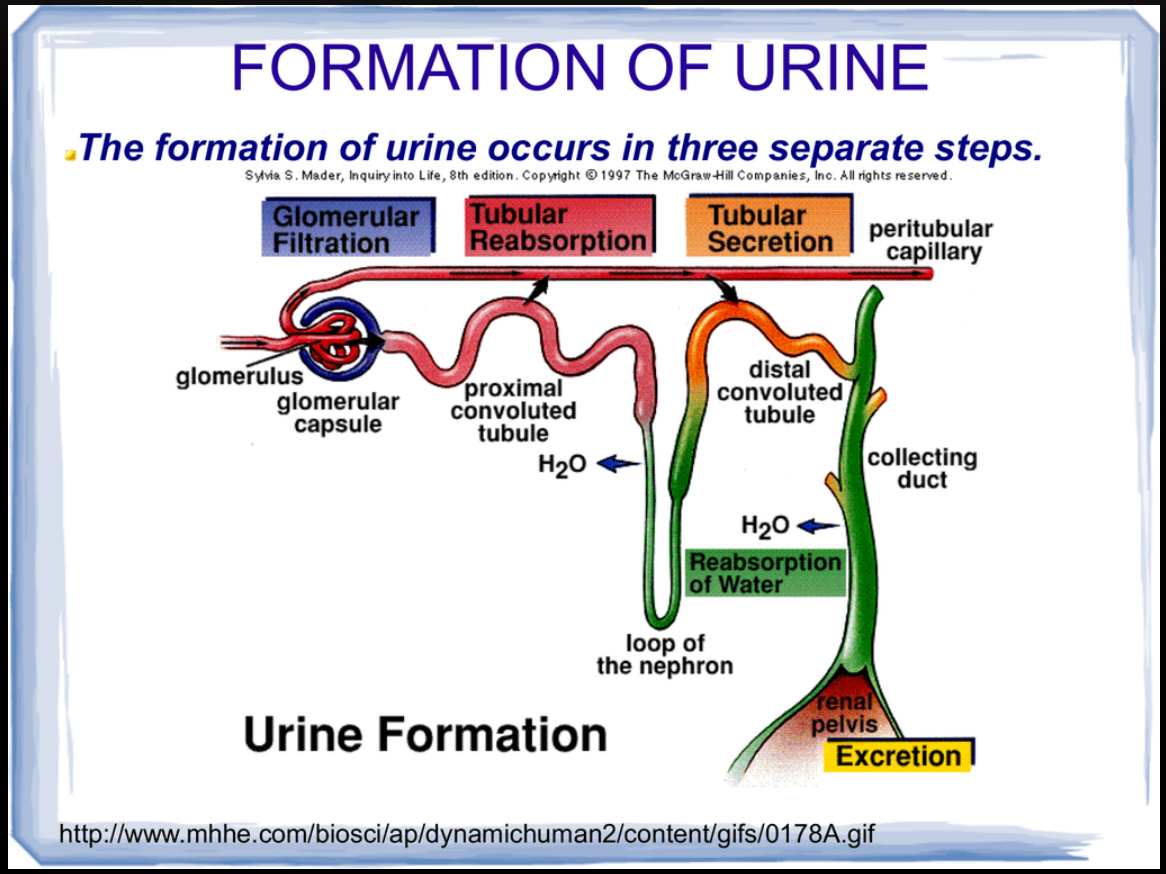
URINE

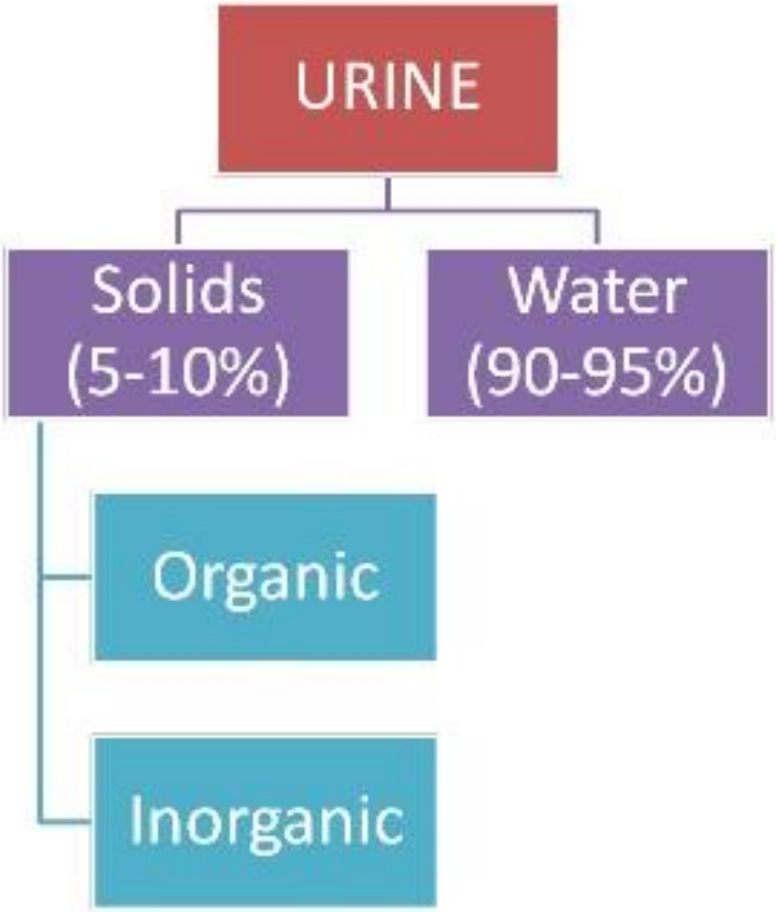
FAIZA GHLAB



URINE **IS FLUID THAT IS FORMED AND EXCRETED BY KIDNEY THROUGH THE PROCESS CALLED URINATION**

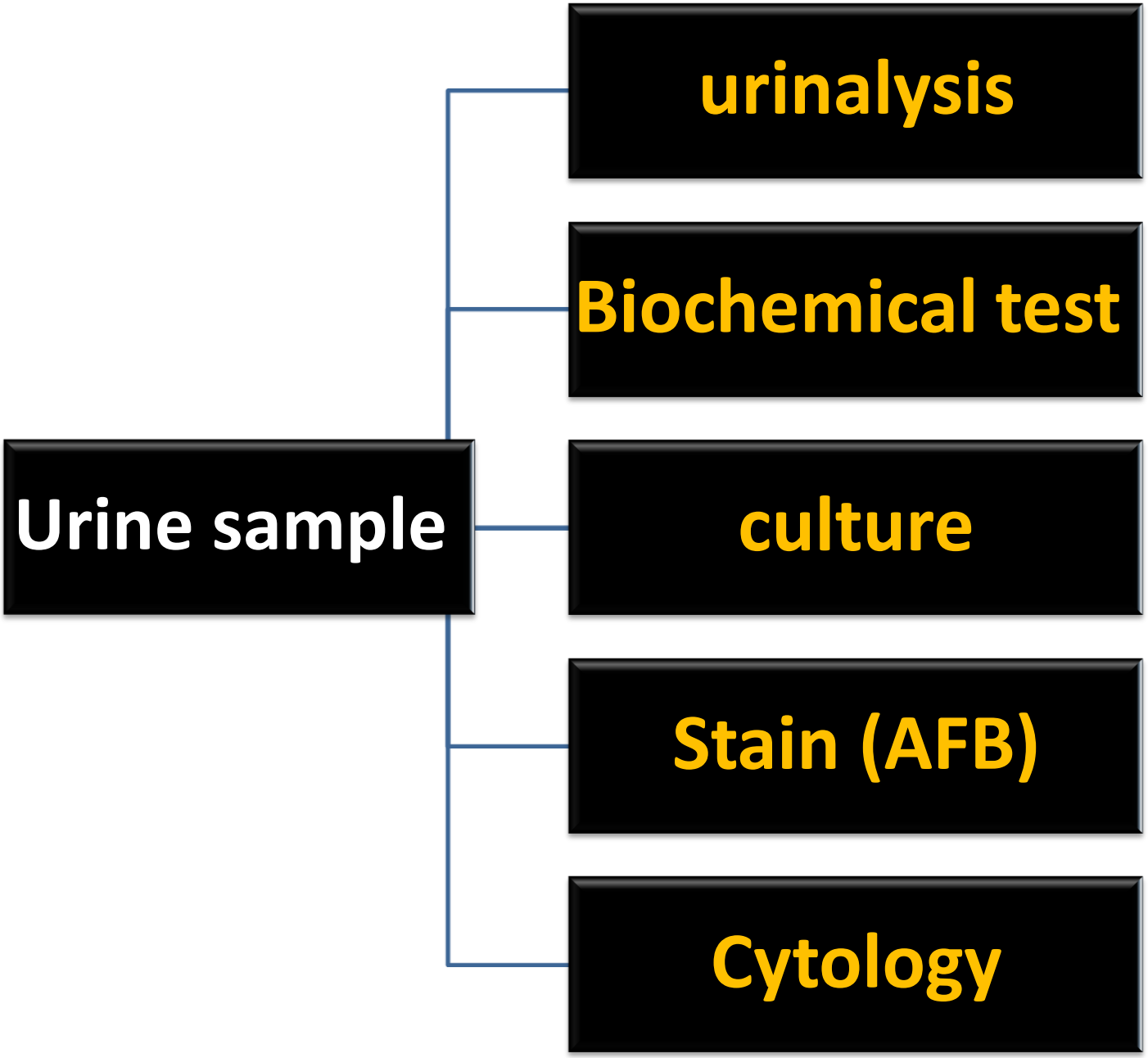


COMPOSITION OF NORMAL URINE



CHEMICAL CONSTITUENTS

Inorganic	Organic
• Chloride • Sulphate • Calcium • Inorganic phosphate • Ammonia	• Urea • Uric Acid • Creatinine • Ethereal Sulphate (Organic Sulphate) • Urobilinogen


urinalysis
Biochemical test
Urine sample
culture
Stain (AFB)
Cytology

URINALYSIS

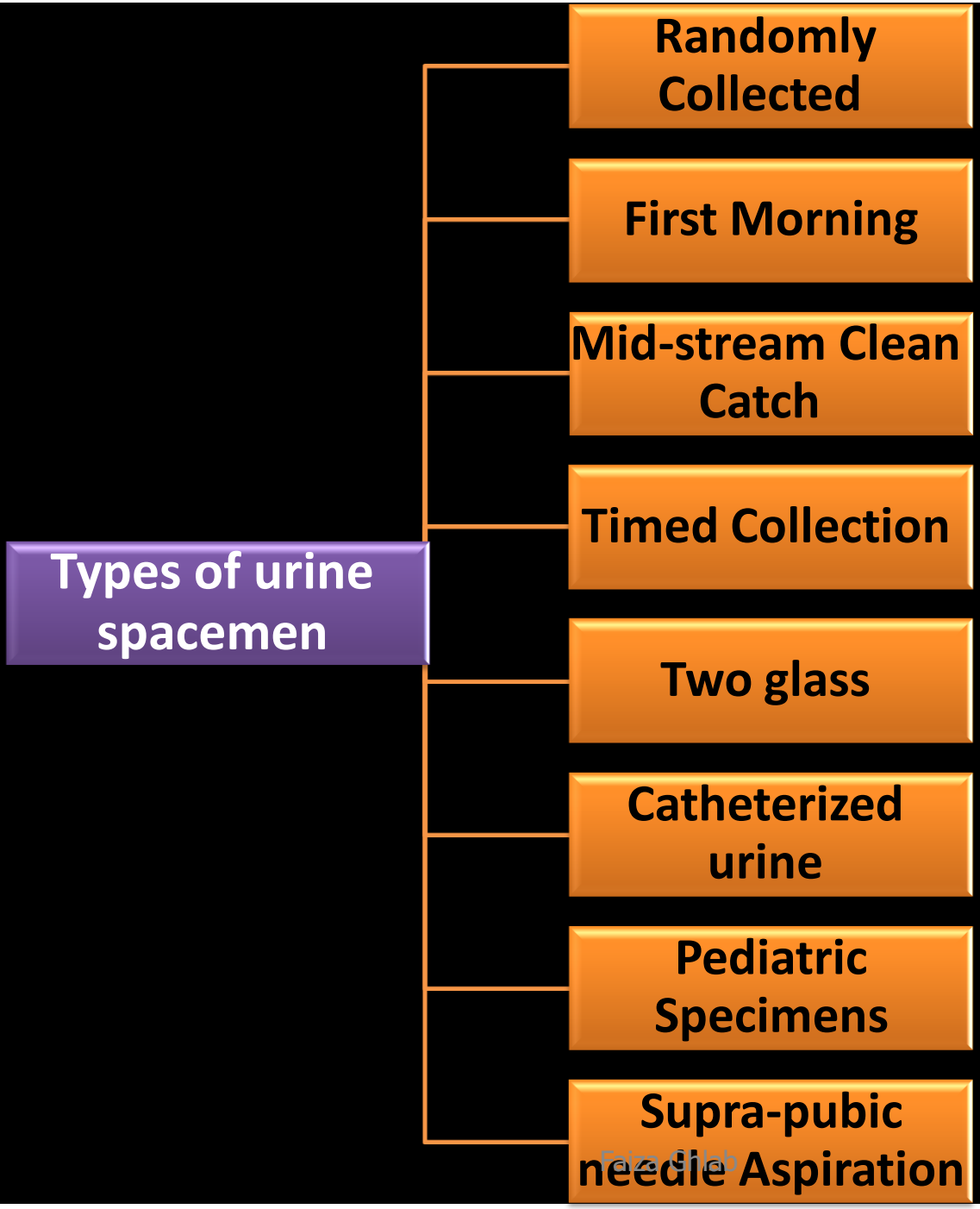
Faiza Ghlab

Purpose

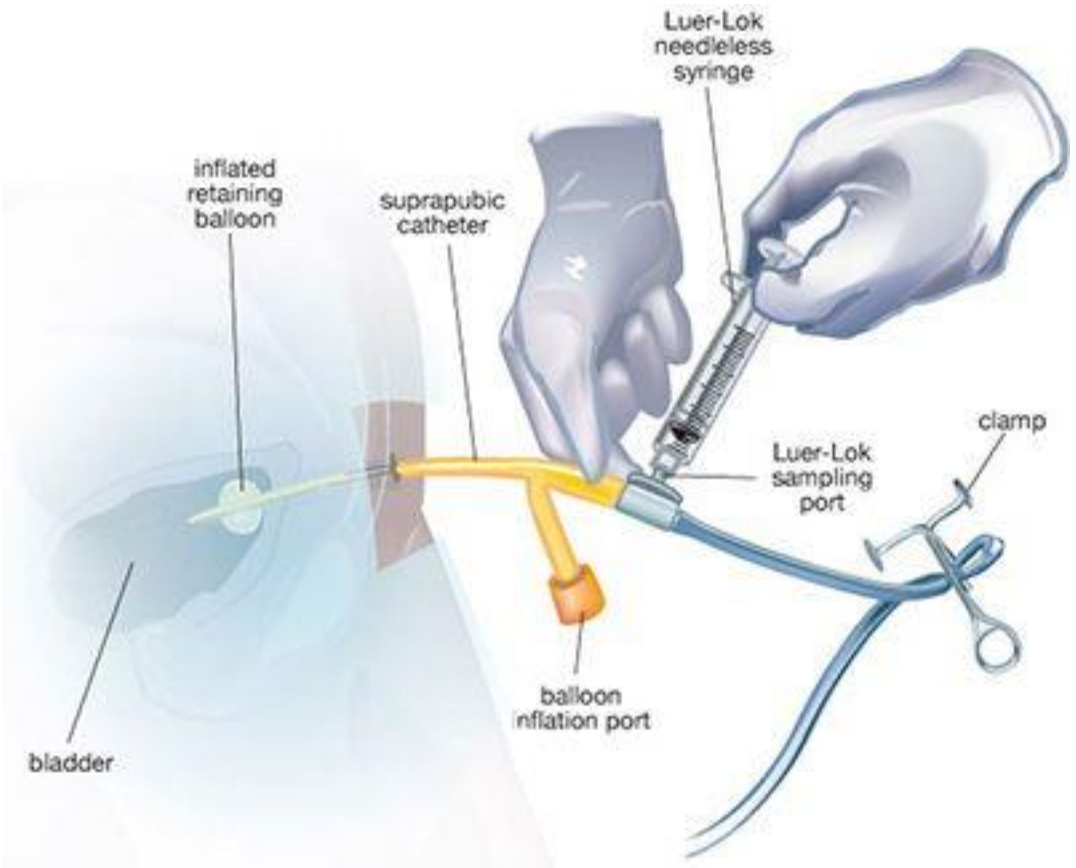
- General evaluation of health
- Diagnosis of disease or disorders of the kidneys or urinary tract
- Diagnosis of other systemic disease that affect kidney function
- Monitoring of patients e.g like diabetes
- Screening for drug abuse eg. amphetamines

Types of urine collection

Urine specimens may be collected in different ways and different time.


Types of urine spacemen
Randomly Collected
First Morning
Mid-stream Clean Catch
Timed Collection
Two glass
Catheterized urine
Pediatric Specimens
Supra-pubic needle Aspiration

Catheterized urine



Pediatric Specimens

Supra-pubic needle Aspiration

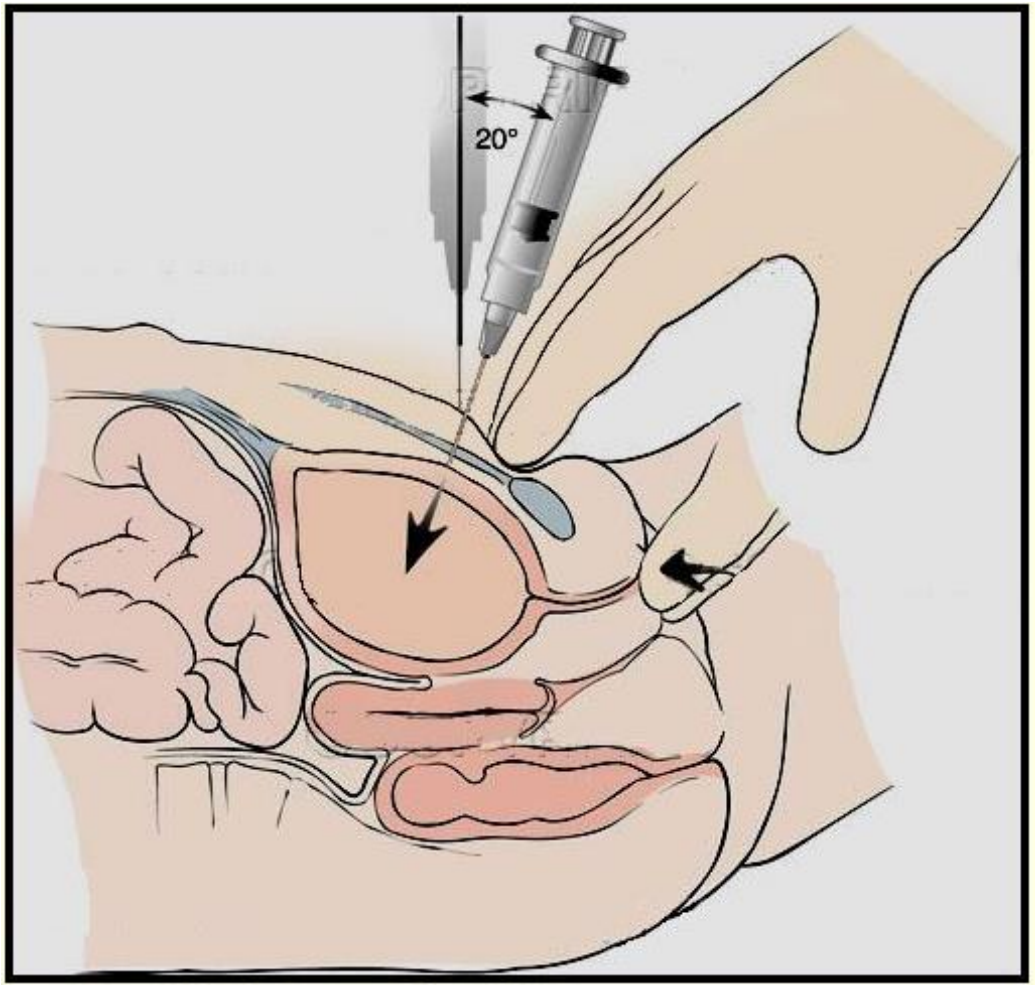


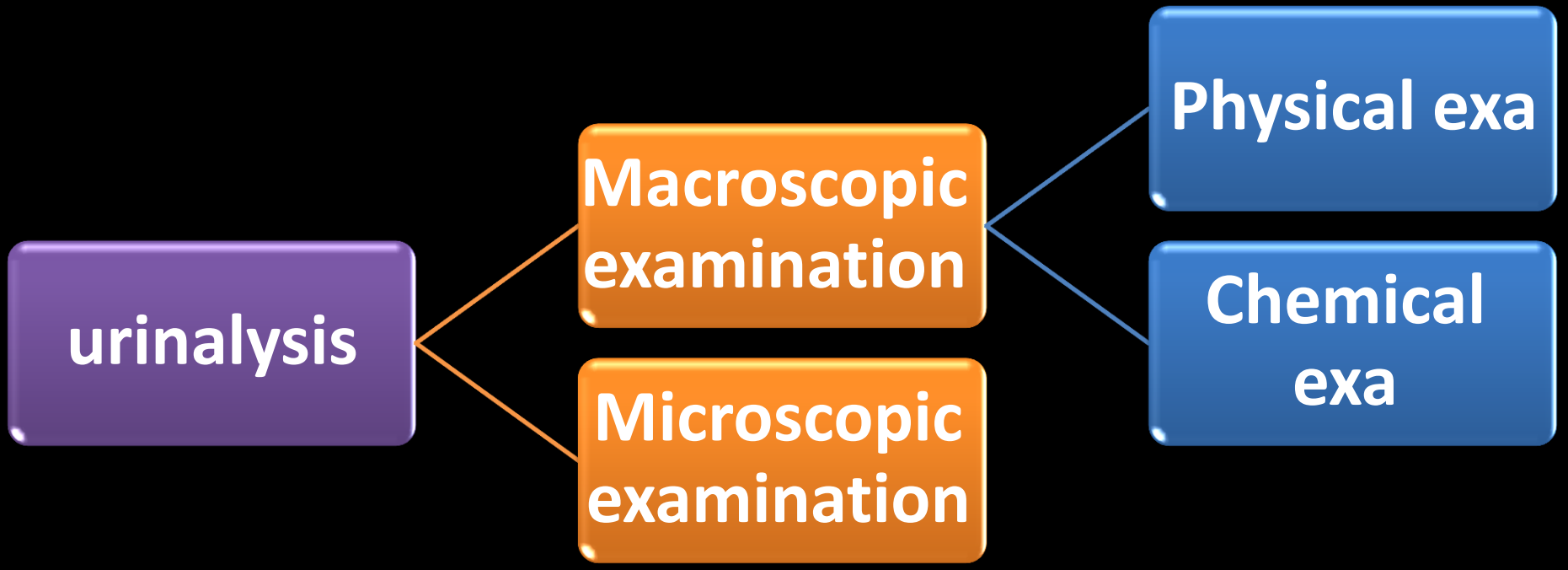
Table 3–4 Types of Urine Specimens

Type of Specimen	Purpose
Random	Routine screening
First morning	Routine screening Pregnancy tests Orthostatic protein
Fasting (second morning)	Diabetic screening/monitoring
2-hour postprandial	Diabetic monitoring
Glucose tolerance test	Optional with blood samples in glucose tolerance test
24-h (or timed)	Quantitative chemical tests
Catheterized	Bacterial culture
Midstream clean-catch	Routine screening Bacterial culture
Suprapubic aspiration	Bladder urine for bacterial culture Cytology
Three-glass collection	Prostatic infection

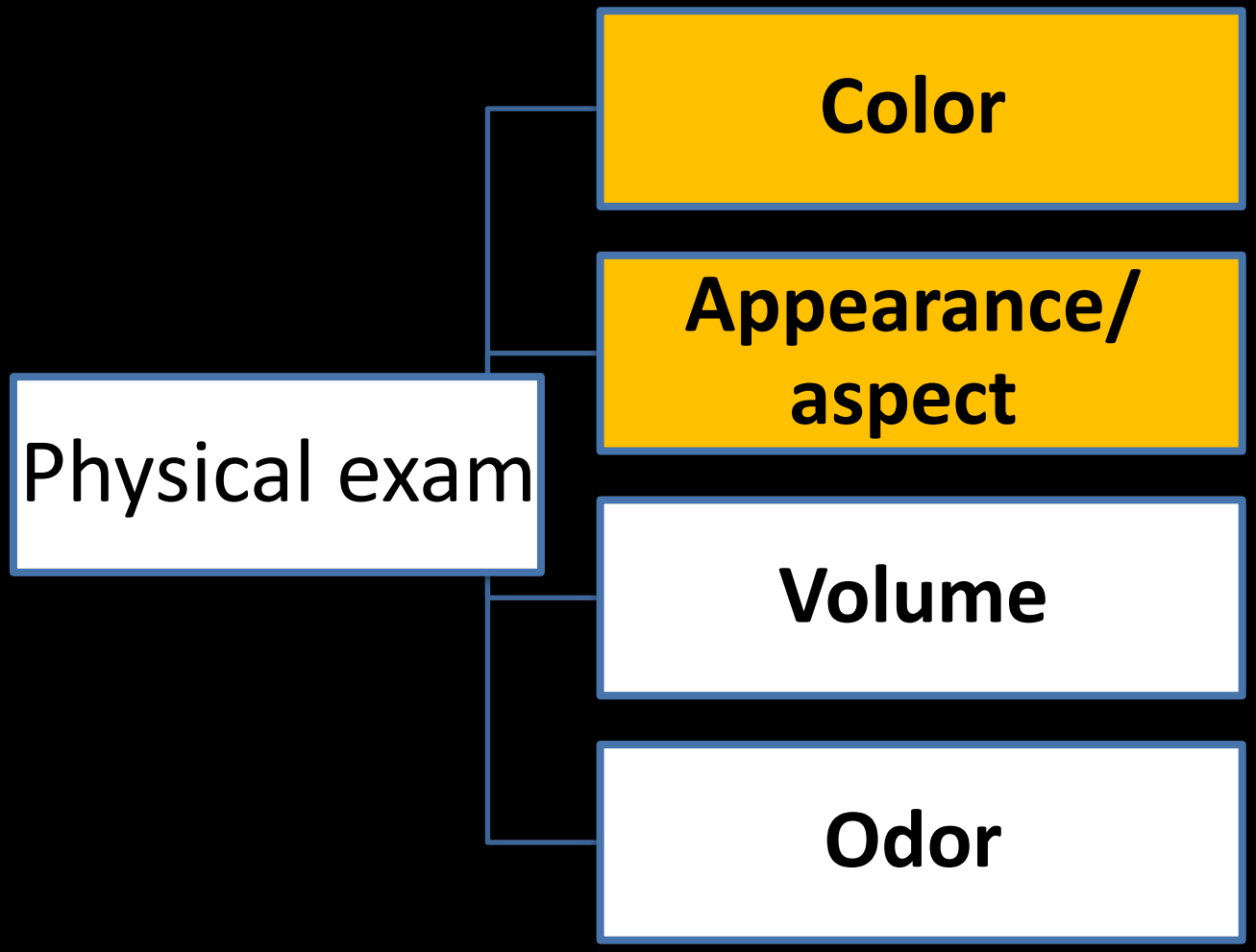
Faiza Ghlab

Specimen Collection

- **Type of specimen (e.g. clean catch)**
- **Analyzed within 1 hours of collection**
- **Free of debris or vaginal secretions**


urinalysis
Macroscopic examination
Microscopic examination
Physical exa
Chemical exa

Urinalysis (physical exam.)



Urine color

Normal urine color ranges from pale yellow to deep amber due to a pigment called urochrome

Table 4–1 Laboratory Correlation of Urine Color[11]

Color	Cause	Clinical/Laboratory Correlations
Colorless	Recent fluid consumption	Commonly observed with random specimens
Pale yellow	Polyuria or diabetes insipidus	Increased 24-hour volume
	Diabetes mellitus	Elevated specific gravity and positive glucose test result
	Dilute random specimen	Recent fluid consumption
Dark yellow	Concentrated specimen	May be normal after strenuous exercise or in first morning specimen
Amber		Deydration from fever or burns
Orange	Bilirubin	Yellow foam when shaken and positive chemical test results for bilirubin
	Acriflavine	Negative bile test results and possible green fluorescence
	Phenazopyridine (Pyridium)	Drug commonly administered for urinary tract infections May have orange foam and thick orange pigment that can obscure or interfere with reagent strip readings
	Nitrofurantoin	Antibiotic administered for urinary tract infections
	Phenindione	Anticoagulant, orange in alkaline urine, colorless in acid urine
Yellow-green Yellow-brown	Bilirubin oxidized to biliverdin	Colored foam in acidic urine and false-negative chemical test results for bilirubin
Green	*Pseudomonas* infection	Positive urine culture
Blue-green	Amitriptyline	Antidepressant
	Methocarbamol (Robaxin)	Muscle relaxant, may be green-brown
	Clorets	None
	Indican	Bacterial infections
	Methylene blue	Fistulas
	Phenol	When oxidized

Color	Cause	Clinical/Laboratory Correlations
Pink Red	RBCs	Cloudy urine with positive chemical test results for blood and RBCs visible microscopically
	Hemoglobin	Clear urine with positive chemical test results for blood; intravascular hemolysis
	Myoglobin	Clear urine with positive chemical test results for blood; muscle damage
	Porphyrins	Negative chemical test results for blood Detect with Watson-Schwartz screening test or fluorescence under ultraviolet light
	Beets	Alkaline urine of genetically susceptible persons
	Rifampin	Tuberculosis medication
	Menstrual contamination	Cloudy specimen with RBCs, mucus, and clots
Brown Black	RBCs oxidized to methemoglobin	Seen in acidic urine after standing; positive chemical test result for blood
	Methemoglobin	Denatured hemoglobin
	Homogentisic acid (alkaptonuria)	Seen in alkaline urine after standing; specific tests are available
	Melanin or melanogen	Urine darkens on standing and reacts with nitroprusside and ferric chloride
	Phenol derivatives	Interfere with copper reduction tests
	Argyrol (antiseptic)	Color disappears with ferric chloride
	Methyldopa or levodopa	Antihypertensive
	Metronidazole (Flagyl)	Darkens on standing

Faiza Ghlab

Urine appearance or urine aspect

Normal urine clear or transparent, any turbidity will indicate.

- WBCs (pus).
- RBCs
- Epithelial cells
- Bacteria
- Casts
- Crystals
- Lymph
- Semen.

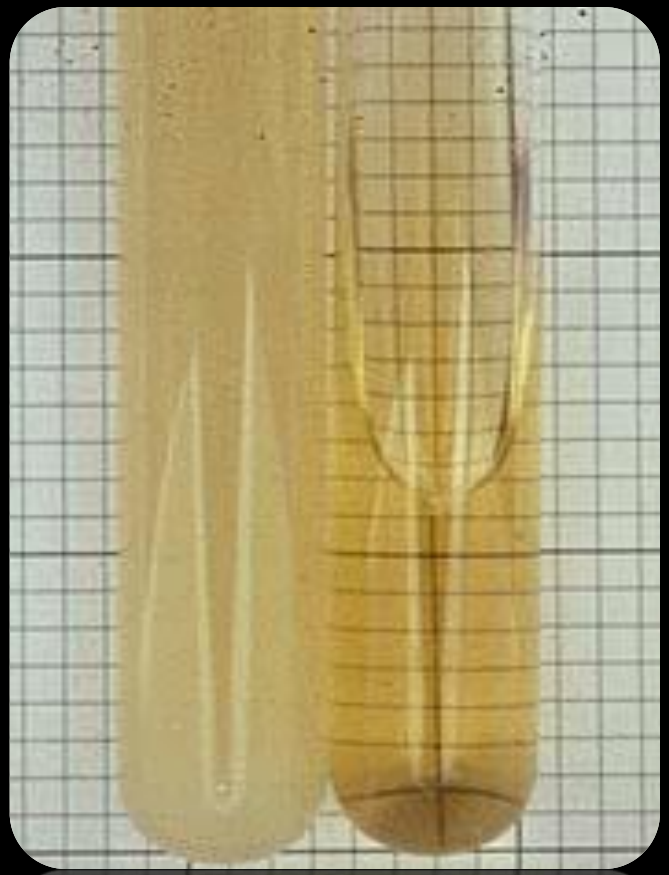
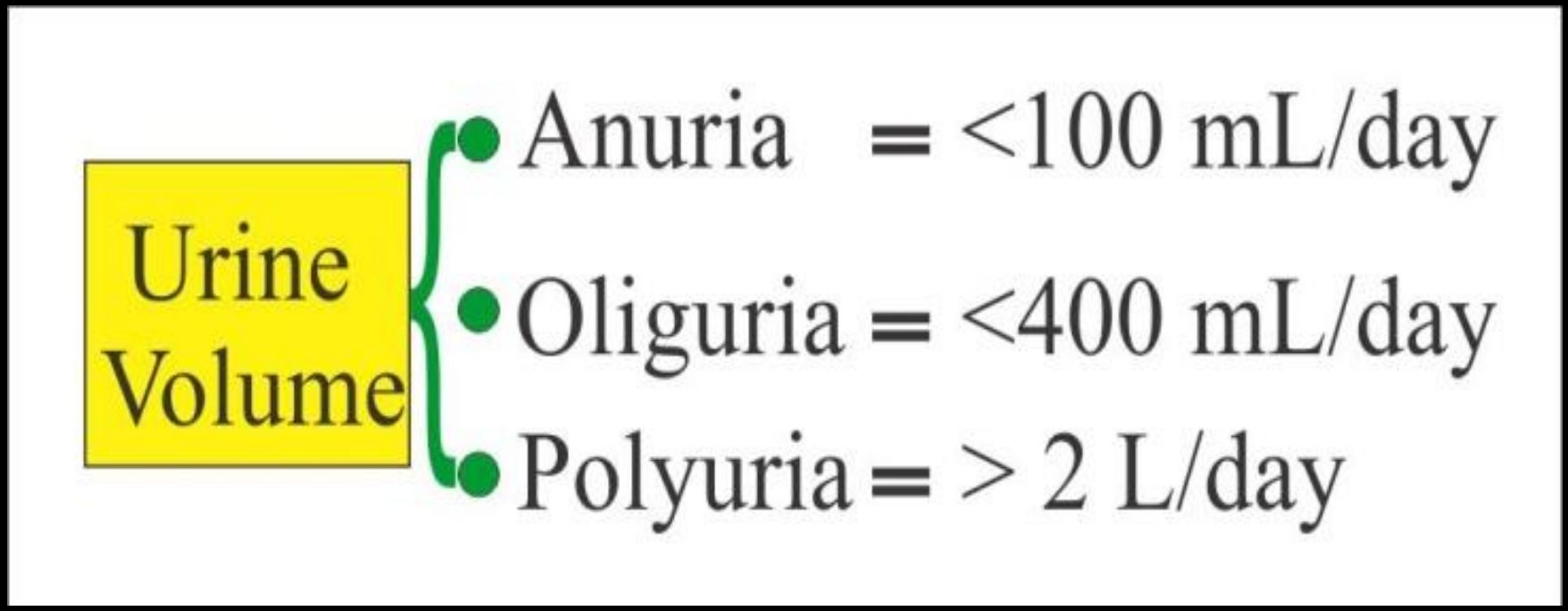


Table 4–2 Urine Clarity

Clarity	Term
Clear	No visible particulates, transparent.
Hazy	Few particulates, print easily seen through urine.
Cloudy	Many particulates, print blurred through urine.
Turbid	Print cannot be seen through urine.
Milky	May precipitate or be clotted.

Urinary volume

Normal urine volume : 800 ml – 2 liter/ day



Nocturia

is a condition in which you wake up during the night because you have to urinate.

❖ **Causes can include :**

A. **high fluid intake**
B. **sleep disorders**
C. **bladder obstruction.**

Causes of polyuria

- **Causes can include :**

A. Diabetes mellitus
B. Diabetes insipidus
C. Polycystic kidney
D. Chronic renal failure
E. Diuretics
F. Intravenous saline/glucose

oliguria

- **Causes can include :**

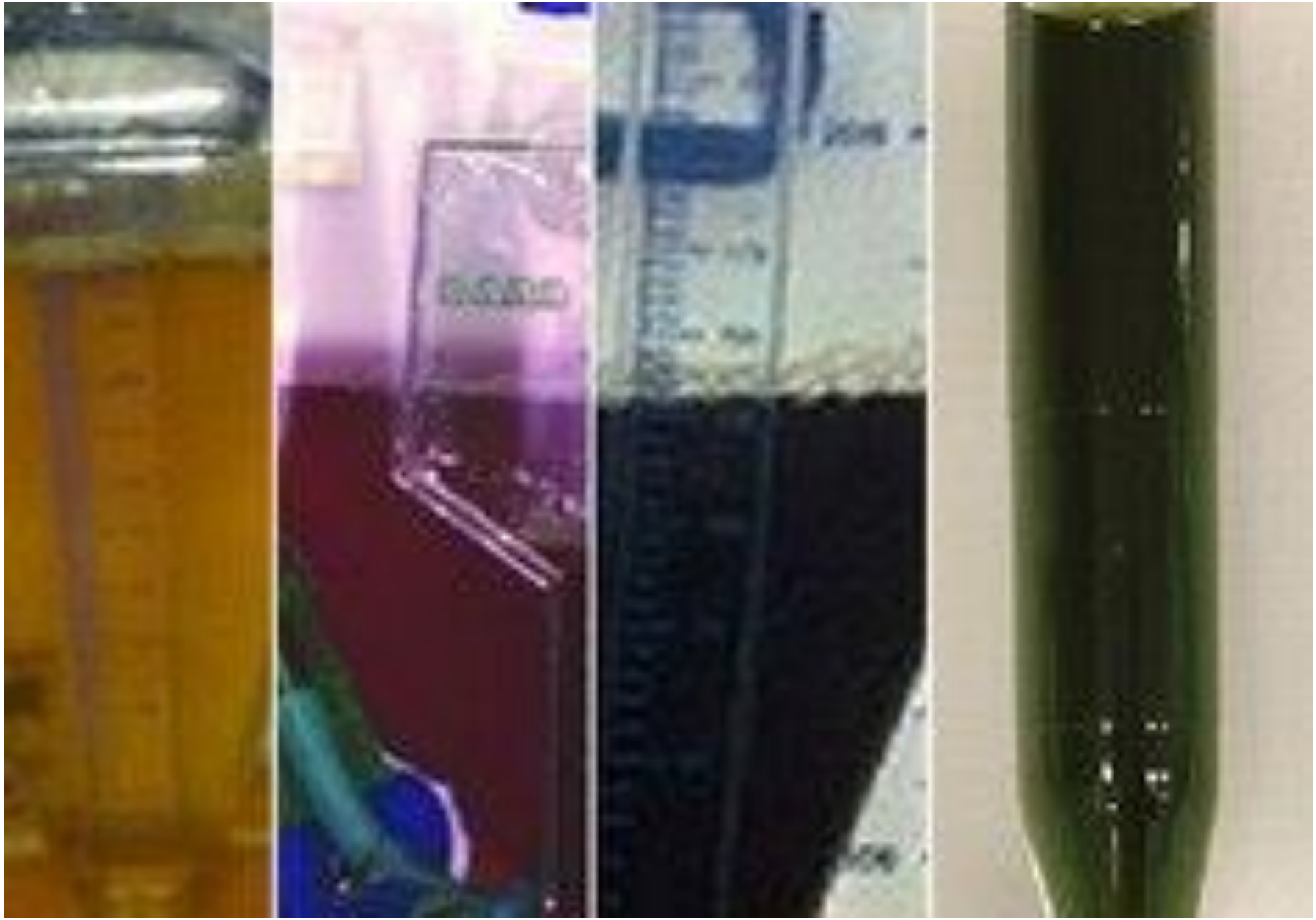
A. Dehydration-vomiting, diarrhoea, excessive sweating
B. Renal ischemia
C. Acute tubular necrosis
D. Obstruction to the urinary tract
E. Acute renal failure

2-Odor:

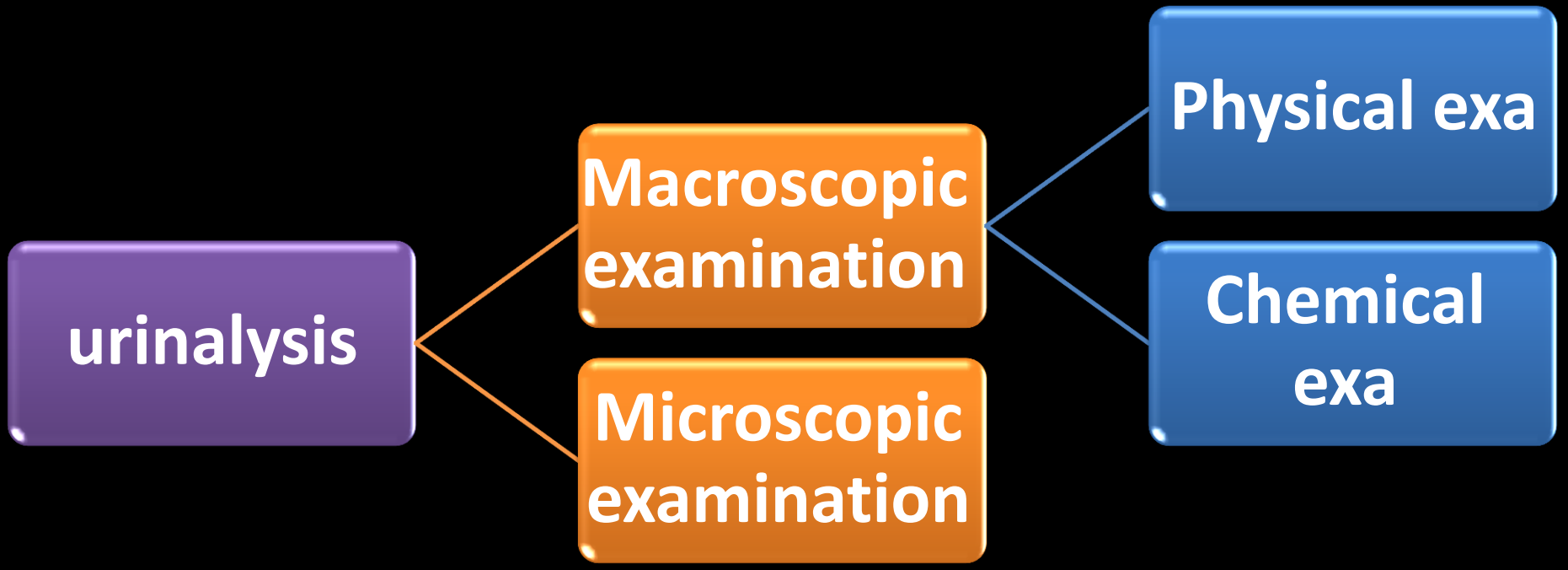
Ammonia-like:	(Urea-splitting bacteria)
Foul, offensive:	Old specimen, pus or inflammation
Sweet:	Glucose
Fruity:	Ketones
Maple syrup-like:	Maple Syrup Urine Disease

3-Color:

Colorless	Diluted urine
Deep Yellow	Concentrated Urine, Riboflavin
Yellow-Green	Bilirubin / Biliverdin
Red	Blood / Hemoglobin
Brownish-red	Acidified Blood (Actute GN)
Brownish-black	Homogentisic acid (Melanin)



Faiza Ghlab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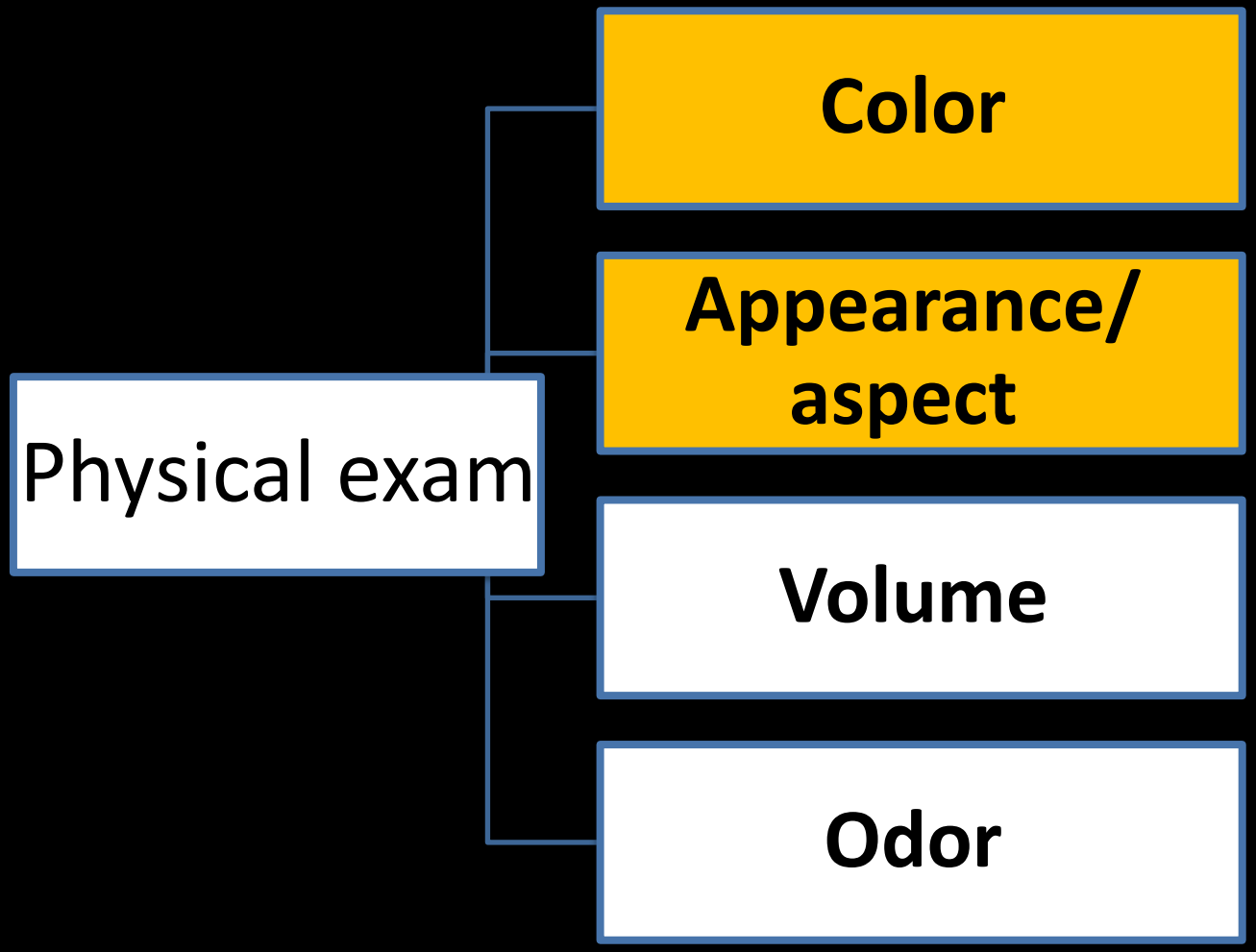
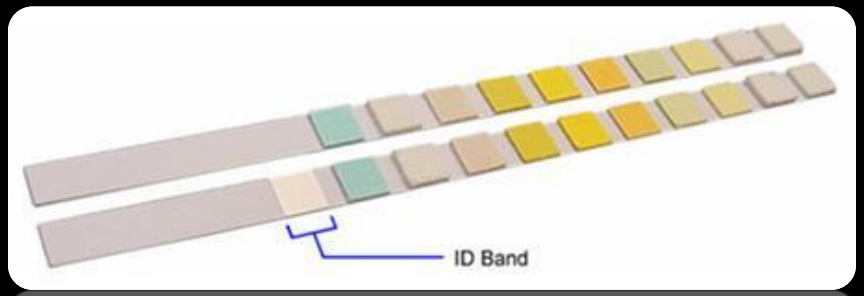
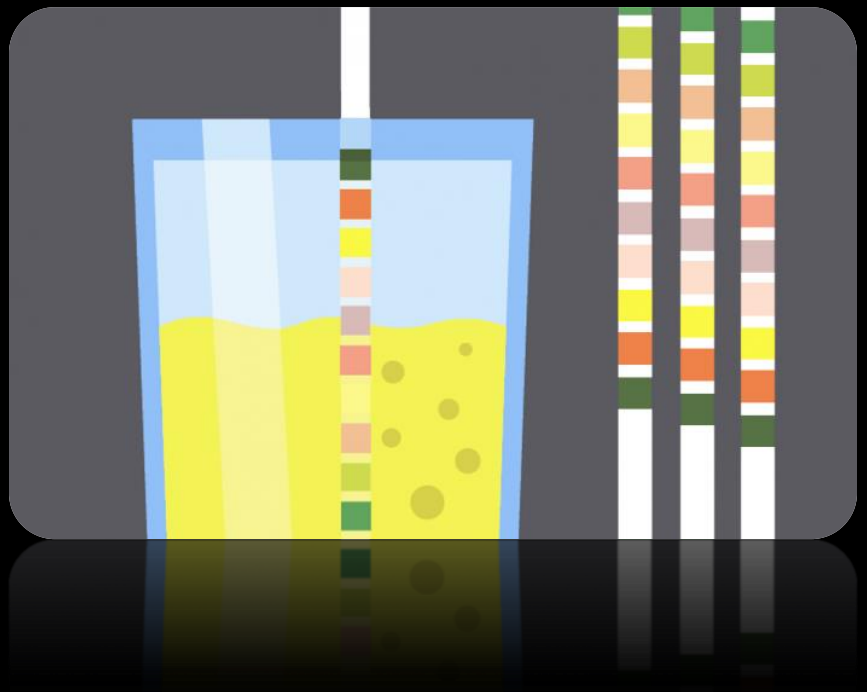


Urinalysis (Chemical exam)





Chemical Analysis

Dipstick or strip method

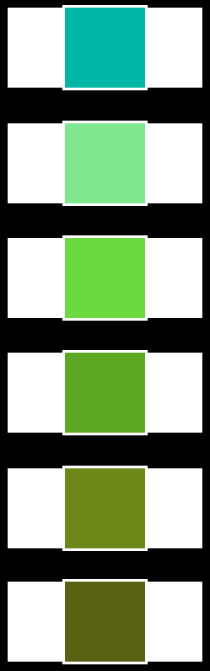
chemical-impregnated absorbent pads attached to a plastic strip.

- Glucose
- Bilirubin
- Ketones
- Specific Gravity
- Blood
- pH
- Protein
- Urobilinogen
- Nitrite
- Leukocyte Esterase

A color-producing chemical reaction takes place when the absorbent pad comes in contact with urine.

The Urine Dipstick:

Glucose



Negative

Trace

+

++

+++

++++

Chemical Principle

Glucose Oxidase

$Glucose + 2\ H_2O + O_2 \dashrightarrow Gluconic\ Acid + 2\ H_2O_2$

Horseradish Peroxidase

$3\ H_2O_2 + KI \dashrightarrow KIO_3 + 3\ H_2O$

Read at 30 seconds
RR: Negative

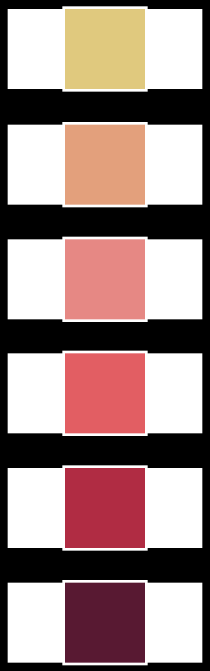
Uses of Urine Glucose Detection

Significance

- Diabetes mellitus.
- Renal glycosuria.
- Pancreatic cancer.
- Acromegaly.
- Cushing syndrome.
- Hyperthyrodism.
- Stress.
- Gestional diabetes

The Urine Dipstick

Ketones



Negative

Trace

+

++

+++

++++

Chemical Principle

Acetoacetic Acid + Nitroprusside
------> Colored Complex

Read at 40 seconds
RR: Negative

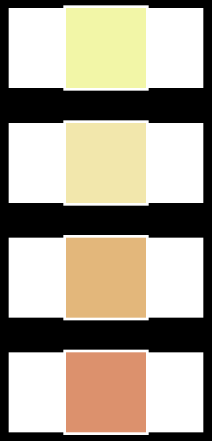
Uses and Limitations of Urine Ketone Detection

Significance

- Diabetic ketoacidosis
- Prolonged fasting
  - Starvation
  - Vomiting
  - Malabsorption

The Urine Dipstick

Bilirrubin



Negative

+ (weak)

++ (moderate)

+++ (strong)

Chemical Principle

Bilirubin + Diazo salt $\xrightarrow{\text{Acidic}}$ Azobilirubin

Read at 30 seconds
RR: Negative

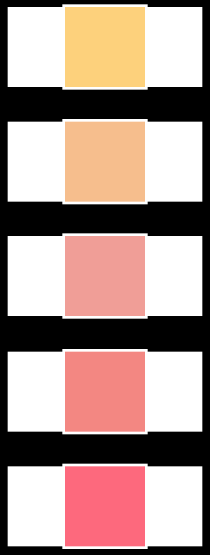
Uses of Urine Bilirubin Detection

Significance

- Hepatitis.
- Cirrhosis
- Liver disorder.
- Biliary obstruction.

The Urine Dipstick

Urobilinogen



0.1 mg/dL

1 mg/dL

2 mg/dL

4 mg/dL

8 mg/dL

Chemical Principle

Urobilinogen + Diethylaminobenzaldehyde
(Ehrlich's Reagent)

-------> Colored Complex

Read at 60 seconds

RR: 0.02-1.0 mg/dL

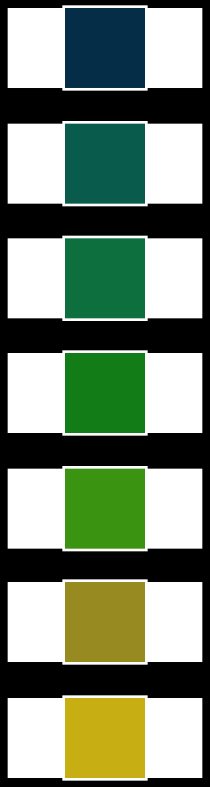
Uses of Urobilinogen Detection

Significance

- High: increased hepatic processing of bilirubin
- Low: bile obstruction

The Urine Dipstick

Specific Gravity



Chemical Principle

X^+ + Polymethyl vinyl ether / maleic anhydride ---------->

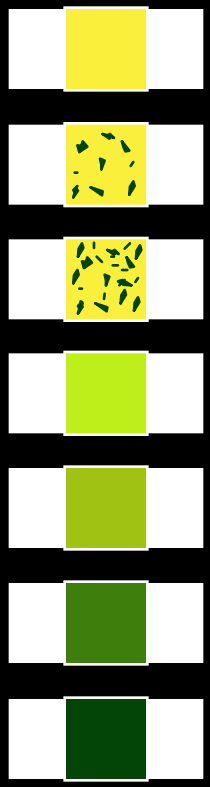
X^+-Polymethyl vinyl ether / maleic anhydride + H^+

H^+ interacts with a Bromthymol Blue indicator to form a colored complex.

Read up to 2 minutes
RR: 1.003-1.035

The Urine Dipstick

Blood



Negative

Trace (non-hemolyzed)

Moderate (non-hemolyzed)

Trace (hemolyzed)

+ (weak)

++ (moderate)

+++ (strong)

Chemical Principle

Lysing agent to lyse red blood cells

Diisopropylbenzene dihydroperoxide + Tetramethylbenzidine

Heme ----------> Colored Complex

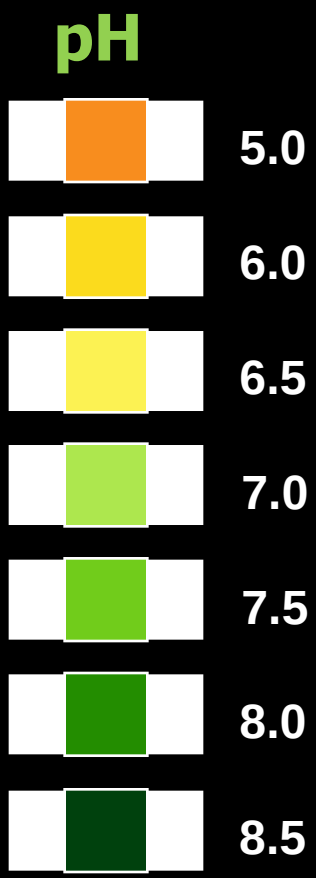
Read at 60 seconds
RR: Negative
Analytic Sensitivity: 10 RBCs

Uses of Urine Blood Detection

Significance

- Hematuria (nephritis, trauma, etc)
- Hemoglobinuria (hemolysis, etc)
- Myoglobinuria (rhabdomyolysis, etc)

The Urine Dipstick



Chemical Principle

H^+ interacts with:
Methyl Red (at high concentration; low pH) and Bromthymol Blue (at low concentration; high pH), to form a colored complexes (dual indicator system)

Read up to 2 minutes
R.R.: 4.5-8.0

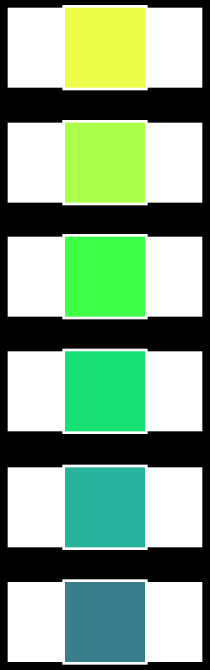
Uses and Limitations of Urine pH Detection

Significance

- Acidic (less than 6.7): metabolic acidosis, high-protein diet , Diabetes mellitus, Dehydration, Medication.
- Alkaline (greater than 8.0): renal tubular acidosis, Hyperventilation, Vomiting , presence of urese producing bacteria.

The Urine Dipstick

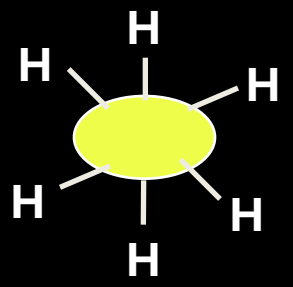
Protein

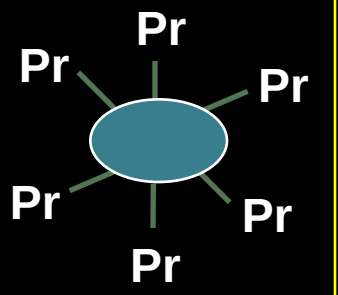


- Negative
- Trace
- + (30 mg/dL)
- ++ (100 mg/dL)
- +++ (300 mg/dL)
- ++++ (2000 mg/dL)

Chemical Principle

"Protein Error of Indicators Method"





Tetrabromphenol Blue
(buffered to pH 3.0)

H^+ H^+ H^+
H^+ H^+ H^+

Pr Pr Pr
Pr Pr Pr

Read at 60 seconds
RR: Negative

Faiza Ghlab

Proteins in "Normal" Urine

Protein	% of Total	Daily Maximum
Albumin	40%	60 mg
Tamm-Horsfall	40%	60 mg
Immunoglobulins	12%	24 mg
Secretory IgA	3%	6 mg
Other	5%	10 mg
TOTAL	100%	150 mg

Causes of Proteinuria

Renal

- Glomerulonephritis
- Nephrotic syndrome
- Renal tumor or infection

Pre-Renal

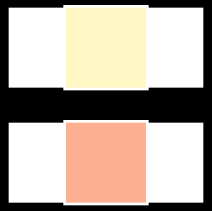
- Fever
- Renal hypoxia
- Hypertension

Post-Renal

- Cystitis
- Urethritis or prostatitis
- Contamination with vaginal secretions

The Urine Dipstick

Nitrite



Negative

Positive

Chemical Principle

Nitrite + p-arsenilic acid $\xrightarrow{\text{Acidic}}$ Diazo compound

Diazo compound + Tetrahydrobenzoquinolinol ----------> Colored Complex

Read at 60 seconds
RR: Negative

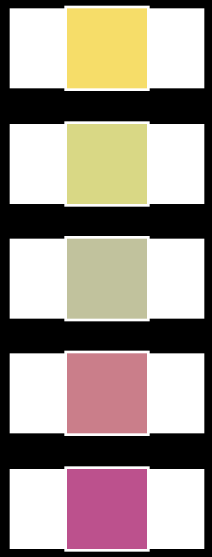
Uses of Nitrite Detection

Significance

- Bacteria in urien bacteriuria

The Urine Dipstick

Leukocyte Esterase



Negative

Trace

+ (weak)

++ (moderate)

+++ (strong)

Chemical Principle

Derivatized pyrrole amino acid ester

Esterases ----------> 3-hydroxy-5-phenyl pyrrole

3-hydroxy-5-phenyl pyrrole + diazo salt ----------> Colored Complex

Read at 2 minutes
RR: Negative
Analytic Sensitivity: 3-5 WBCs

Uses Leukocyte Esterase Detection

Significance

- Pyuria = Pus in urine
- Acute inflammation
- Renal calculus

How to write final report

Faiza Ghlab

Med Labs
The Ultimate Accuracy
مختبرات الميدلاب التخصصية
الرقة ... المتناهية

Patient Name: اشواق حميد احمد
Sex: Female Age: 30 Years
code No.: 220825
Dr. رشا الفراس:
Date :29/12/2020
Bill Nd12332
Ser No.5705

URINE ANALYSIS

Test	Results	Normal Value
MACROSCOPIC:		
Appearance:	Turbid	
Color:	yellow	
Specific gravity:	1.030	
BIOCHEMICALS(SCREENING METHOD):		
Haemoglobin :	3+	Nil
PH:	Acidic	
Protiens:	Trace	Nil
Glucose:	Nil	Nil
Ketones:	2+	Nil
Nitrite:	positive	Negative
Bilirubin:	Nil	Nil
Urobilinogen:	Normal	Normal
Blood	Nil	Nil
MICROSCOPIC:		
W.B.Cs:	Numeruos	0-5 /HPF
R.B.Cs:	1-3	0-5 /HPF
Epthelial cells:	8-10	/HPF
Others:		
Bacteria :	Seen	
Mucous :	2+	

Printing Date:29/12/2020 07:10:10

Huda Balas

مختبرات الميدلاب التخصصية تتمنى لكم دوام الصحة

Signature

Med Labs
The Ultimate Accuracy
مختبرات الميدلاب التخصصية
الدقة ... المتناهية

Patient Name: شكريه علي محمد
Sex: Female Age: 50 Years
code No.: 309118
Dr. : عادل النجار
Date :29/12/2020
Bill No:12266
Ser No. 5639

URINE ANALYSIS

Test	Results	Normal Value
MACROSCOPIC:		
Appearance:	Semi-turbid	
Color:	Yellow	
Specific gravity:	1.030	
BIOCHEMICALS(SCREENING METHOD):		
Haemoglobin :	Nil	Nil
PH:	Acidic	
Protiens:	Nil	Nil
Glucose:	Nil	Nil
Ketones:	Nil	Nil
Nitrite:	Negative	Negative
Bilirubin:	Nil	Nil
Urobilinogen:	Normal	Normal
Blood	Nil	Nil
MICROSCOPIC:		
W.B.Cs:	3-5	0-5 /HPF
R.B.Cs:	1-3	0-5 /HPF
Epthelial cells:	Many	/HPF
Others:	.	
Mucous :	2+	

Printing Date: 29/12/2020 05:26:28

Huda Balas
Signature

مختبرات الميدلاب التخصصية تتمنى لكم دوام الصحة

Med Labs
مختبرات الميدلاب التخصصية

Faiza Ghlab

Thank you!